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INSECT VECTORS OF THE DUTCH ELM DISEASE

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Available data on insect vectors of the Dutch elm disease is briefly summarized below for the information of those attending the conference on the Dutch elm disease held in Washington, D.C. on October 26, 1933. A survey to determine the possible distribution of the elm bark beetles in the United States is still in progress. The data as to the distribution of Scolytus multistriatus are, in all probability, very incomplete.

Investigations conducted by various scientists in Europe have proved beyond a reasonable doubt that the Dutch elm disease is transmitted from dying infested trees to living uninfested trees by either of two species of bark beetles belonging to the genus Scolytus. Four species of this genus have been found associated with the Dutch elm disease in Europe, and any of them are capable of transmitting the spores of the disease from diseased to healthy elms. These are Scolytus scolytus Fab., the large elm bark beetle; S. multistriatus Marsh., the smaller elm bark beetle; S. laevis Chap.; and S. pygmaeus Fab. Of these the first two are to be found practically throughout Europe wherever elm trees occur. The latter two (laevis and pygmaeus) are much more limited in their distribution and are usually not so numerous even where they do occur. Thus S. scolytus and S. multistriatus are considered the two species most important as vectors of the disease in Europe, and as the first of these is a much more aggressive form it is considered of prime importance both as a vector of the disease and as the cause of important injuries on its own account.

Of these two species one, S. multistriatus, has been known to be established in this country since 1909, when it was found in elm trees on the Harvard campus. This was reported by W. J. Chapman (1910) in Psyche XVII, p. 63-69. The infestation was well established and rather widespread throughout Cambridge. In 1924 and again in 1926 and 1929 the present writer received specimens for identification from New Jersey, near New York City; from Long Island in 1926; from Stamford Conn., in 1920; and from Philadelphia, Pa., in 1932. This was the status of our knowledge of the distribution of the smaller elm bark beetle up until this fall.

Following the discovery of the Dutch elm disease in New Jersey the smaller elm bark beetle was found associated with the disease in dying elms, and work was begun by the Bureau of Entomology upon this insect and other possible insect vectors of the disease. In connection with this study a thorough survey is being made to determine the distribution of the elm bark beetles in this country. Up to the present time the survey has covered only Massachusetts, Connecticut, southern New York, and part of New Jersey,

and the distribution as found in these States is indicated on the accompanying map. The survey is being continued and there is no doubt but that the bark beetles will be found in many more localities than those indicated. In connection with this scouting for the smaller elm bark beetle a search is also being made for the more serious larger elm bark beetle (S. scolytus) which has been brought in on imported logs but which is not yet known to have become established.

In studying the very incomplete map of distribution it should be noted that there seem to have been two centers of introduction - Boston and New York. It is possible that when the survey is completed there will be indications of separate introductions at other ports, such as Philadelphia, Baltimore, and Norfolk. At present we know that opportunities for such introductions have occurred but the insects may possibly not have become established.

The life history of neither of the European elm bark beetles is at all well known in Europe and still less so in America, so there remains much work to be done on this subject. This work has already been started in New Jersey. Chapman working at Cambridge believed that only one generation a year occurred. Eichhoff in Germany states that the beetles may or may not complete two generations a season. Gillanders in England states that there are two generations in southern England and only one in northern England. Liese and V. Butovitch, from their own work and from a review of the literature, believe that two generations are the rule with a possible third generation in warmer climates.

Both European work and our own incomplete observations in this country indicate that some of the beetles are in flight at all times during the warm months. In Germany two periods of concentrated emergence have been observed and in Holland three flights in one season have been reported. We are likely to find similar variations in this country due both to difference in climate and to seasonal differences in different years.

As a usual rule the smaller bark beetle seems to pass the winter in the larval stage. In May and June the young adults emerge and fly to healthy trees, where they feed for some time on the young twigs before they are ready to deposit their eggs. It is this feeding of the young adults that makes them very dangerous as disease carriers. If they have come from a tree infected with Graphium, they carry with them the spores of the disease, both on their exterior coats and in their digestive canals. These spores are introduced into the feeding burrows and the tree becomes inoculated with the disease.

When full fed the young beetles enter the trunk or branches of a broken tree, or one weakened by disease or otherwise, and there make longitudinal egg-galleries in which they lay their eggs. If Dutch elm disease

is prevalent such affected trees are almost sure to be chosen for breeding places. Thus the presence of the disease furnishes more numerous and suitable breeding places for the insect and results in its increase, and the presence of numerous bark beetles from such material results in the inoculation of more trees - a vicious and ever-widening circle!

The larger elm bark beetle (S. scolytus) is in Europe considered the most important vector of the Dutch elm disease. It is much more aggressive than the smaller species and is often solely responsible for the death of trees. Its establishment in this country would be a very serious matter. At present it is not known to be established in America, but it has been intercepted several times on elm logs from France at several ports -- New York, Baltimore, Norfolk, New Orleans. Future scouting for both beetles is to be conducted near these ports of entry, and near veneer factories, some of which are far inland, to which the logs were consigned. The beetles may also have escaped and become established along the lines of transportation from the Atlantic coast to as far west as Indianapolis, Chicago, and Kansas City, to which cities some of the logs have in the past been consigned.

The life history of the larger elm bark beetle is similar to that of its smaller sister species, and similar gaps in our knowledge concerning it exist. The adults are in flight at most times during the warmer months, with usually two periods of greater numbers.

With establishment of the embargo on elm logs having the bark still on, there should be little danger of introduction of this pest in the future, but there is a decided danger that it has already become established somewhere in the country, either at ports of entry or points of destination, and a sharp lookout should be kept for this serious pest by all entomologists and all tree lovers.

It is entirely possible that native American insects may also be agents in the transmittal of the Dutch elm disease, and full cognizance of this possibility is being taken in the investigations now under way.

Explanation of Illustrations

Figs. 1 and 2. Scolytus scolytus Fab., dorsal and side views. In dorsal view note the confused arrangement of punctures in the interspaces. In side view note the small projections from the third and ^ufourth abdominal segments. These are distinguishing characters of this species. Actual length of insect, about 5.7 mm.

Figs. 3 and 4. Dorsal and lateral views of Scolytus multistriatus Marsh. In dorsal view note the closely striate elytra. In lateral view note hornlike projection extending backward from near base of abdomen. Actual length of insect about 3 mm.

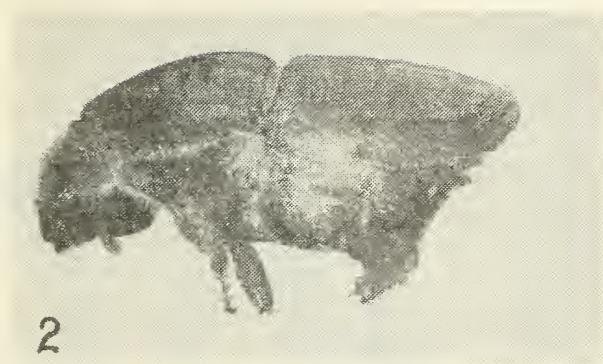
Fig. 5. Brood galleries of the smaller elm bark beetle as they appear in the inner bark.

Fig. 6. Feeding scars made by young adults in feeding upon living twigs. The healthy trees are inoculated through these injuries by spores carried by the beetles.

Fig. 7. Map showing the present known distribution of the smaller elm bark beetle in the United States. The survey now in progress will undoubtedly show much wider distribution of this insect and may also show establishment of the larger elm bark beetle as well.



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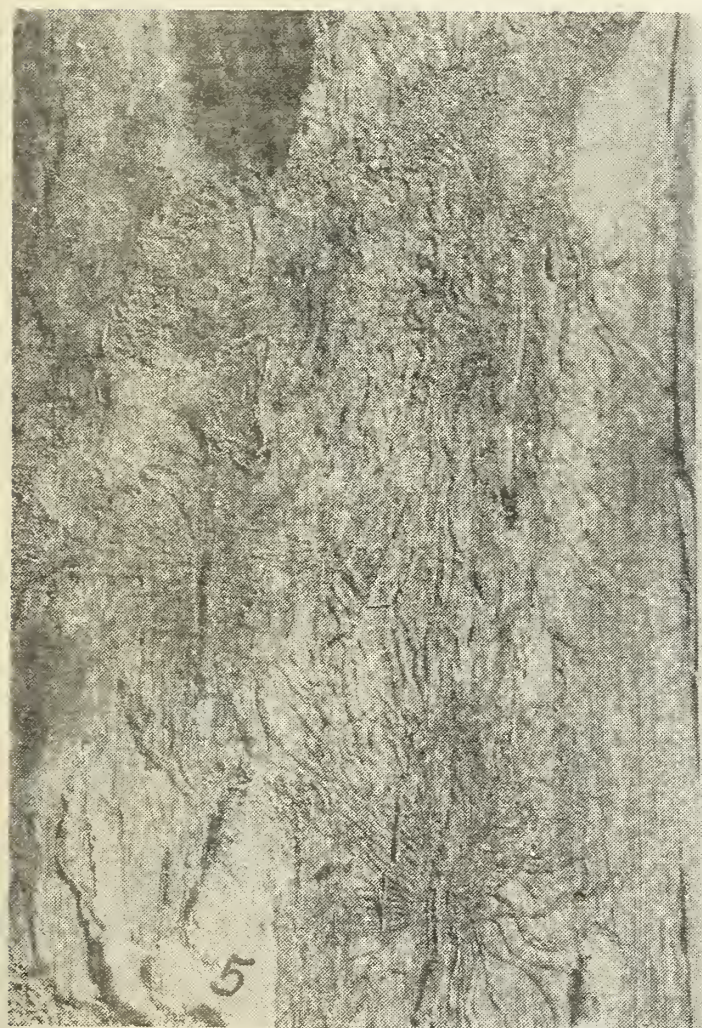
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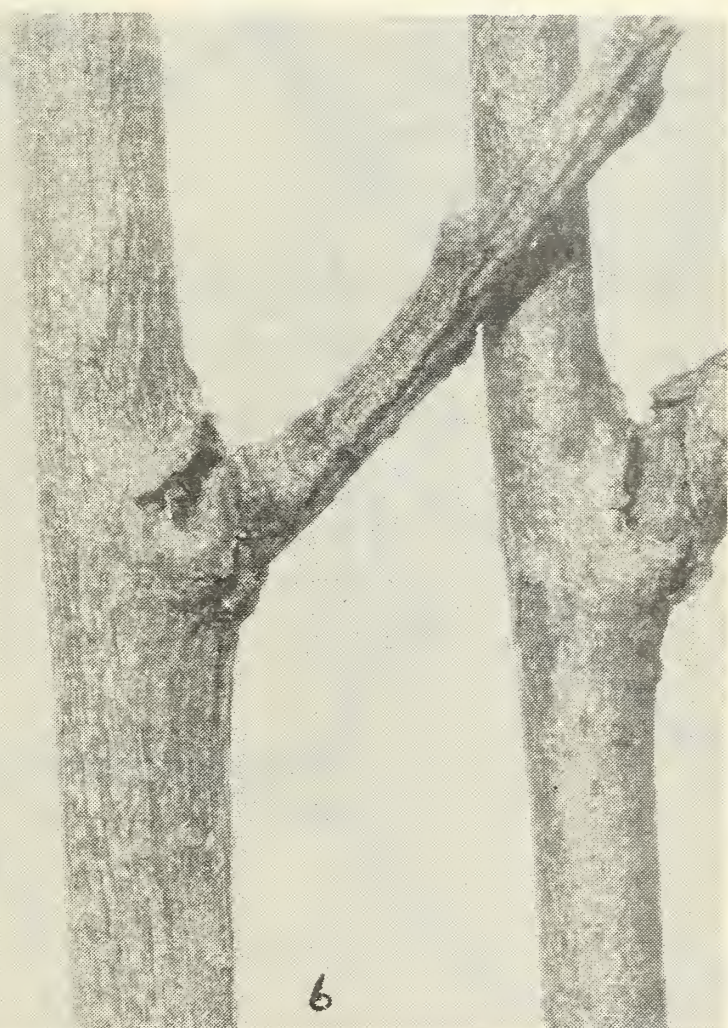
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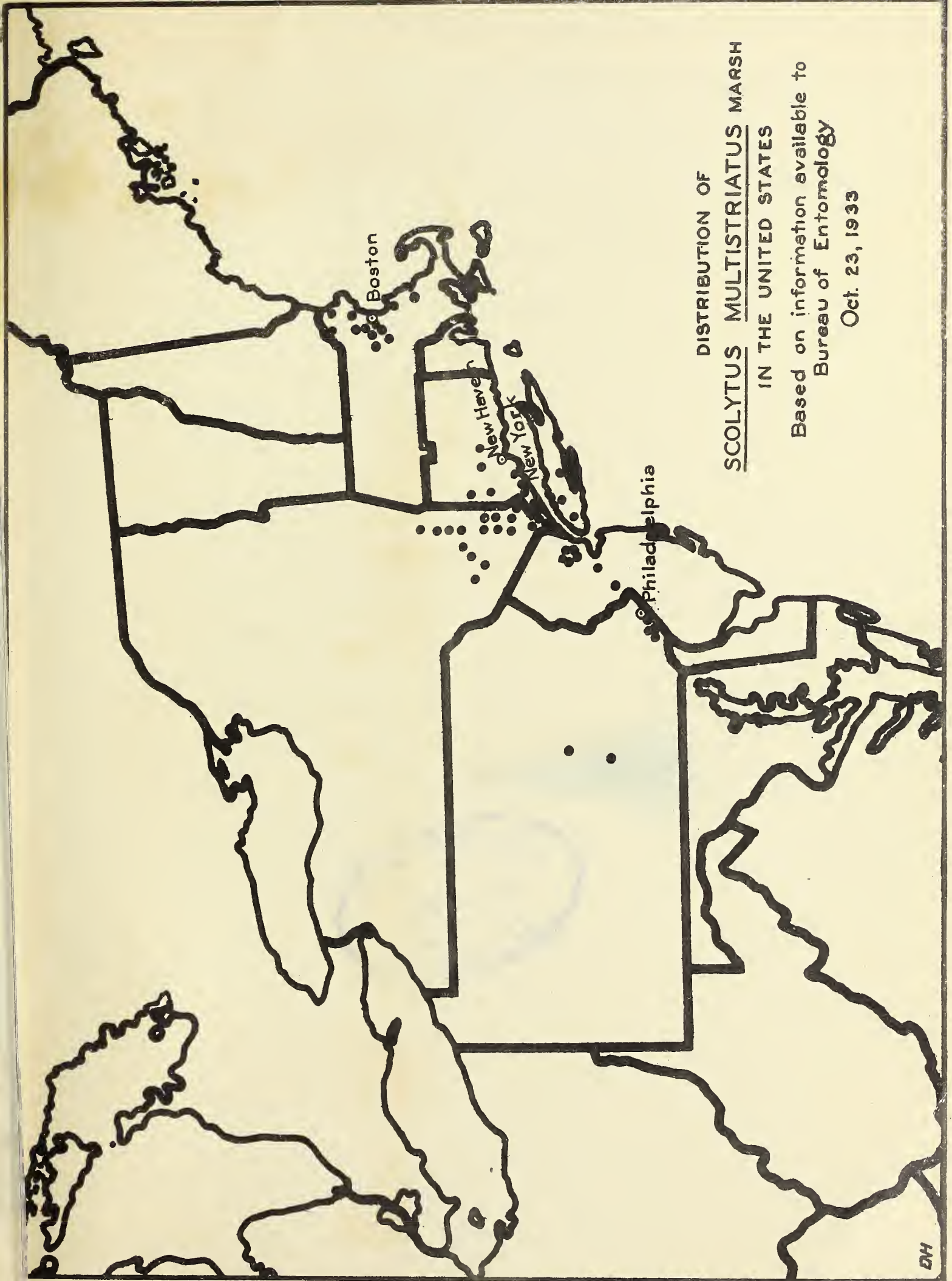
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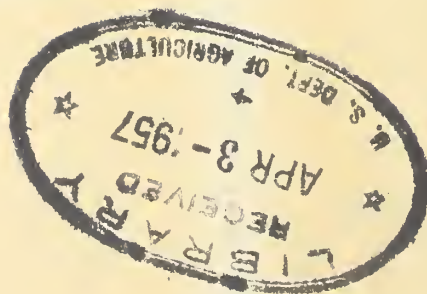


DISTRIBUTION OF
SCOLYTUS MULTISTRIATUS MARSH
IN THE UNITED STATES

Based on information available to
Bureau of Entomology

Oct. 23, 1933





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